LIVERMORE LAB
# REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 1-5, 2012

## Popular Mechanics OUTFLOPPING THE WORLD

**From left, Bruce Goodwin and Mike McCoy stand in awe of Sequoia. Photo courtesy of Jason Madara/*Popular Science*.**

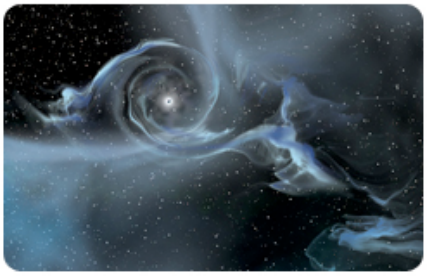
Sequoia, an IBM Blue Gene/Q supercomputer newly installed at the Laboratory in June officially became the most powerful supercomputer in the world and is ranked No. 1 on the industry-standard TOP500 list of the world's fastest high performance computing systems. It clocks in at 16.3 petaflops (quadrillion floating point operations per second).

And for this feat, the supercomputer has earned a Breakthrough Award from *Popular Mechanics* magazine. Bruce Goodwin, principal associate director for Weapons and Complex Integration (WCI), Michel McCoy, head of LLNL's Advanced Simulation and Computing (ASC) program, and representatives from IBM received the award at a ceremony Thursday evening in New York City. Goodwin also participated in an afternoon panel discussion about technological innovation sponsored by *Popular Mechanics*.

The annual *Popular Mechanics* Breakthrough Awards recognize the 10 top "world changing" innovations each year in fields ranging from computing and engineering to medicine, space exploration and automotive design. Breakthrough Awards are given in two categories: innovators, whose inventions will make the world smarter, safer and more efficient in the years to come, and products, which are setting benchmarks in design and engineering today.

To read more, go to *Popular Mechanics*.

QUEST INTO THE ABYSS



**An artist's drawing shows a large black hole pulling gas away from a nearby star. Image courtesy of NASA E/PO, Sonoma State University, Aurore Simonnet**

There's a high-tech hunter on the horizon and its job is to detect the elusive giants known as black holes. Launched in June 2012, NuSTAR -- NASA's Nuclear Spectroscopic Telescope Array -- is expected to identify black holes that are billions of light years away.

To date, only about 100 black holes have been identified. But with NuSTAR, hundreds more are expected to be found by observing their brightly glowing high energy X-rays.

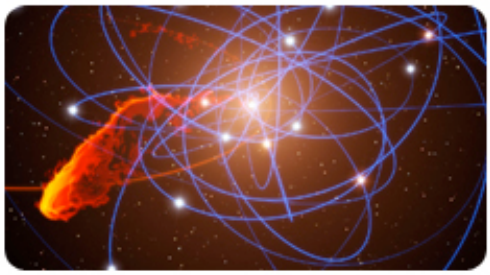
That Lab's Bill Craig has been heavily involved in the project since it was proposed 10 years ago.

"We're looking for very bright sources and those bright sources are indicators of black holes because those conditions only are produced in the extreme environments around a black hole," Craig said.

He also said NuSTAR will create images that are 10 times sharper than previous instruments.

To see more, go to KQED's Quest.

Beach Carolina Magazine.com COSMIC FATAL ATTRACTION



**The gas cloud, named G2, is barreling toward a black hole.**

The Laboratory recently completed a study concerning the fate of a newly discovered gas cloud that soon will be devoured by a supermassive black hole that resides at the center of the Milky Way galaxy.

The gas cloud, known as G2, is expected to pass within 40 billion kilometers (270 times the distance between the Earth and the Sun) of the black hole named Sgr A* in June of next year.

This work helps to provide an unprecedented opportunity to study the disruption of a gas cloud by the intense gravitational forces of a black hole.

Simulations, such as the ones done by collaborators at the College of Charleston, are particularly useful at predicting the future behavior of astronomical events.

In the case of G2, the simulations predict that the cloud will begin to experience significant disruption starting in 2013. However, the cloud will not fall directly into the black hole, but will be gradually torn apart over the coming decades. This will lead to a steady feeding of Sgr A*, which may increase its brightness.

To read more, go to *Beach Carolina Magazine*.


**Julio Friedmann**

There are micro earthquakes that happen under the earth that are not even heard by the naked ear. However, Laboratory scientists have technology that can decipher whether that sound is coming from a nuclear weapons test, an earthquake or a mine collapse.

This same technology is being used for hydrofracking – a method of boring a hole deep into the earth with water to extract natural gas.

Friedmann said that hydrofracking causes little earthquakes under the earth that are 10 million times less energy than one could feel, but they can be heard. By tracking these earthquakes, Laboratory scientists are able to determine whether hydrofracking is fracturing rocks where they are supposed to.

To see the full interview, go to NY1.

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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